ANCIENT MONUMENTS LABORATORY

REPORT OF GEOPHYSICAL SURVEY AT CROMHALL, AVON

NGR: ST 686897

Survey no. 3/80

Dates of fieldwork:

magnetic survey 5-6.3.80
resistivity survey 19.3 + 1-2.4.80

Plans enclosed:

1. Location of survey grid, 1:500 (based on RMC Ltd site plan)
2. Magnetometer survey, 1:250
3. resistivity survey plots, 1:250

1. SITE

The object of the survey was to locate any remains of the Cromhall Roman villa surviving within the area of the proposed quartzite quarry, and to test for evidence of any additional archaeological features. The geology of the site is carboniferous sandstone with clay overburden. The quartzite outcrops to about 1m from the surface along the length of the site.

2. SURVEY METHOD

A grid of 30m squares was marked out at the W side of the area affected and close to the recorded villa site as indicated on plan 1. A magnetic survey of squares 2 - 9 was carried out by the AM Laboratory using the fluxgate gradiometer and field plotting system to give the plot shown in plan 2. A survey of this kind responds to earthwork features and will discriminate areas disturbed through past occupation, but it only exceptionally records building foundations as such.

A resistivity survey is usually more effective in locating structural remains, and readings covering squares 1, 6 and 7 close to the villa were supplied by RMC Ltd. These were processed here to give the plots included in plan 3.

3. RESULTS

Magnetic Survey

The response obtained in a magnetometer survey varies with the initial ferrous content of the topsoil and the degree of contrast with the subsoil. It also depends in part on the strength of local magnetic enhancement through oxide conversion which occurs through burning or in the presence of decayed organic debris and which is often associated with human activity. Here the topsoil is only weakly magnetic (susceptibility = 9 x 10^{-6} emu/gm), and the degree of enhancement apparently slight. The local magnetic anomalies marked on the chart are therefore weak and poorly differentiated from the background soil noise, and likely to represent only an incomplete response to subsurface variations.

There is some increase in the general noise level near the villa in the area shaded in squares 7 and 8. Some source of magnetic disturbance is likely to be present there but few distinct anomalies are identifiable, and the response is weaker than would be expected in the presence of any

substantial burnt clay structure such as a hypocaust. High readings in one corner of square 8 are caused by the electricity pylon. The plot is quieter away from the villa to the N of the shaded area, but some anomalies which could be significant in the unresponsive conditions of the site are visible. Possibly outbuildings to the villa could be present in squares 8 and 9.

To the S of the villa the noise level again increases slightly in squares 2 - 4, and given the magnetically weak soil conditions there might be an archaeological cause for this. There are some lateral features causing displacement of the traverses (marked by dotted lines eg in square 3), and these could be boundary ditches. There is also an extended N - S feature at the E side of squares 2 and 3. This could be a ditch or roadway but it is more substantial than other anomalies detected. It lies parallel to the direction of the quartzite outcrop and so perhaps marks a natural change in soil depth.

The two very intense disturbances outlined at the S end of square 2 might be caused by such highly magnetic structures as kilns or ovens, but could also be due to pieces of buried iron. The strong anomaly at the centre of square 6 is more isolated and symmetrical than those in square 2 and almost certainly represents a buried iron object.

Resistivity Survey

The computer plots in plan 3 are shown in the same orientation as the magnetic chart. They include square 1 (not surveyed magnetically), as well as squares 6 and 7.

The unfiltered plot (3.1) is dominated by a band of high readings, which if archaeological could only be caused by solid masonry near the surface, perhaps a road, or else by an enormous ditch. There is no reason to expect these here and man-made constructions of such size should affect the magnetic survey. The effect is more likely to be largely geological because the feature again conforms to the line of the quartzite outcrop, which is within 1m of the surface and should be detectable in the survey.

In the filtered plot (3.2) neighbouring readings are compared to extract local variations, and here a more archaeologically significant disturbance is visible in square 1. Relatively high readings form a rectangular outline within the square. The feature does not align with either the survey orientation or the N - S geological disturbance and is the kind of response that would be expected from building foundations. The plan of the feature is more clearly seen in the dot-density plot (3.3). The response is fairly weak, which might be due to wet conditions at the time of the survey, or to the state of preservation after the 19th C excavations, but a systematic rectangular pattern is visible around the feature noted in plot 3.2. The pattern is indicated tentatively by dotted lines on the second copy of the plot (3.4), where the high readings in squares 6 and 7 are also seen to be displaced in part in a way which respects the orientation of the dotted outlines. The geological effect is still dominant but it may be that the archaeological and geological components are superimposed and that at least some part of the villa building extends into these squares.

4. CONCLUSIONS

Structural remains appear to occur in square 1 and may extend into squares 6 and 7, but here the geological background is dominant and the evidence uncertain. The magnetic survey shows some increased response in

the vicinity of the villa, and rather less activity at the S of the area surveyed. Some anomalies to the N of the villa could also be significant. Further resistivity work (eg in squares 2, 3 and 9) could help establish the nature of the features in these areas, but the results would not necessarily be conclusive. Soil conditions and the character of the site are not at all favourable for geophysical investigation, and both magnetic and resistivity detection methods are likely to produce only limited and partial evidence in comparison with that obtainable from trial excavation.

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CROMHALL

GEOPHYSICAL SURVEY

magnetometer survey:

resistivity survey:

1:500

0 30m

DoE
Ancient Monuments Laboratory
Geophysics Section

(Plan based on RMC site plan B.)

ST 686897

9

8

7

6

pylon

5

4

3

2

N

CROMHALL

Magnetometer Survey

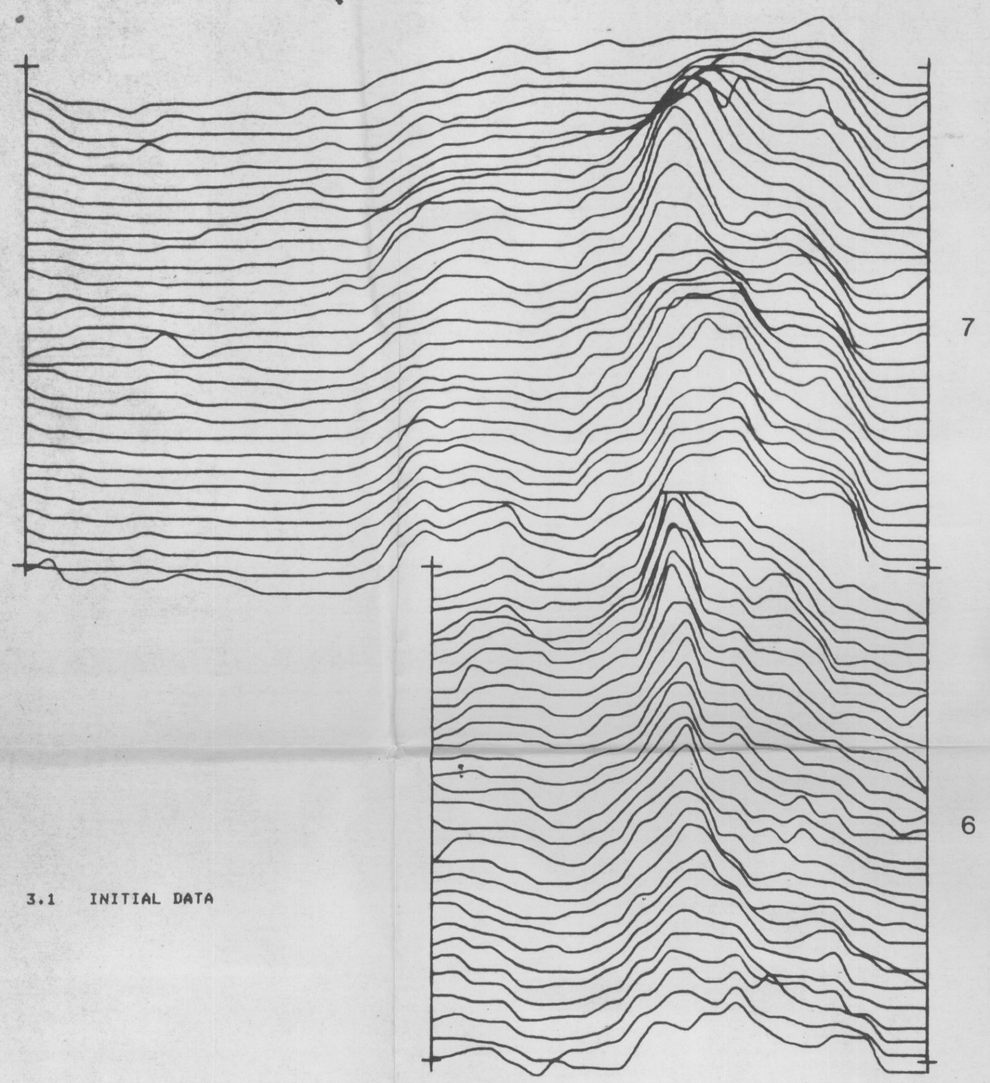
AM Lab 1980

< 5γ
> 5γ
magnetic anomalies

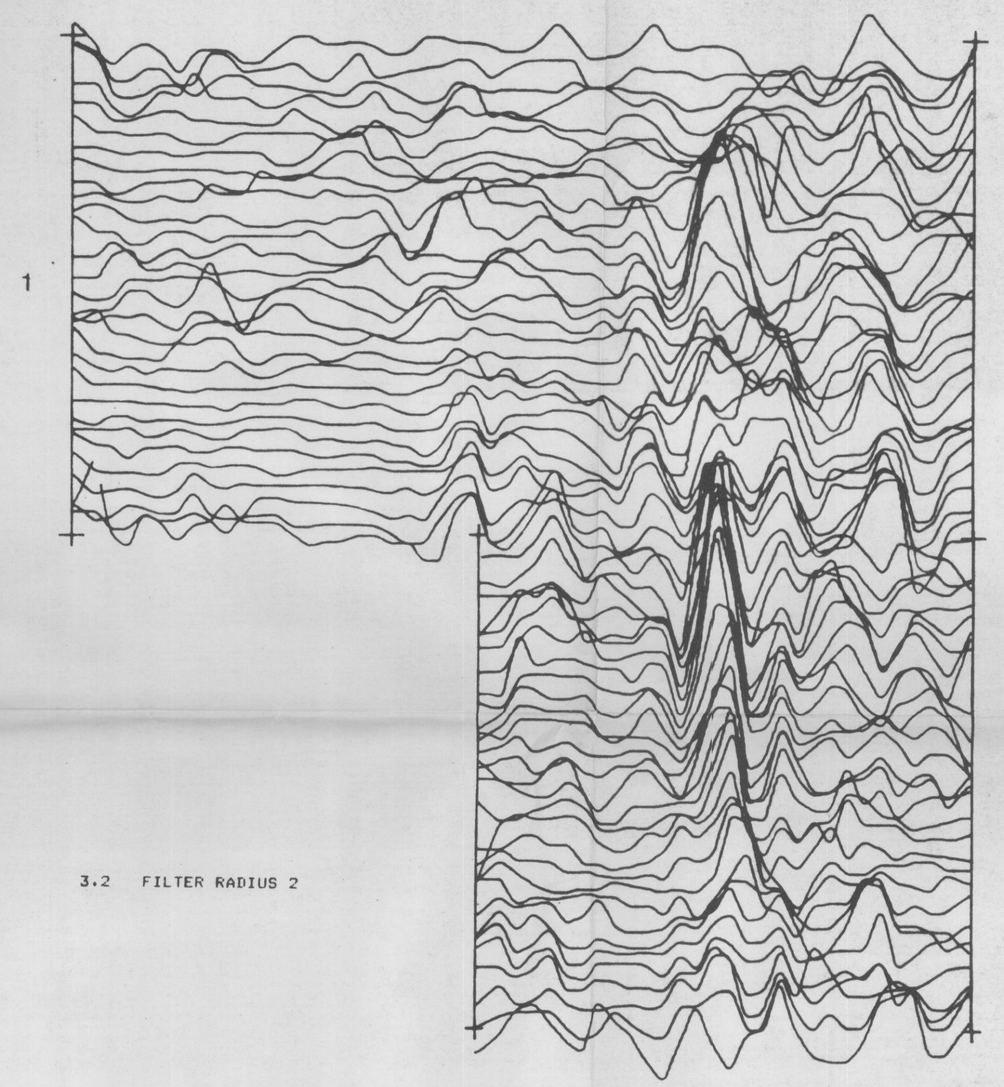
vertical scale 12·5 gamma/cm

1:250

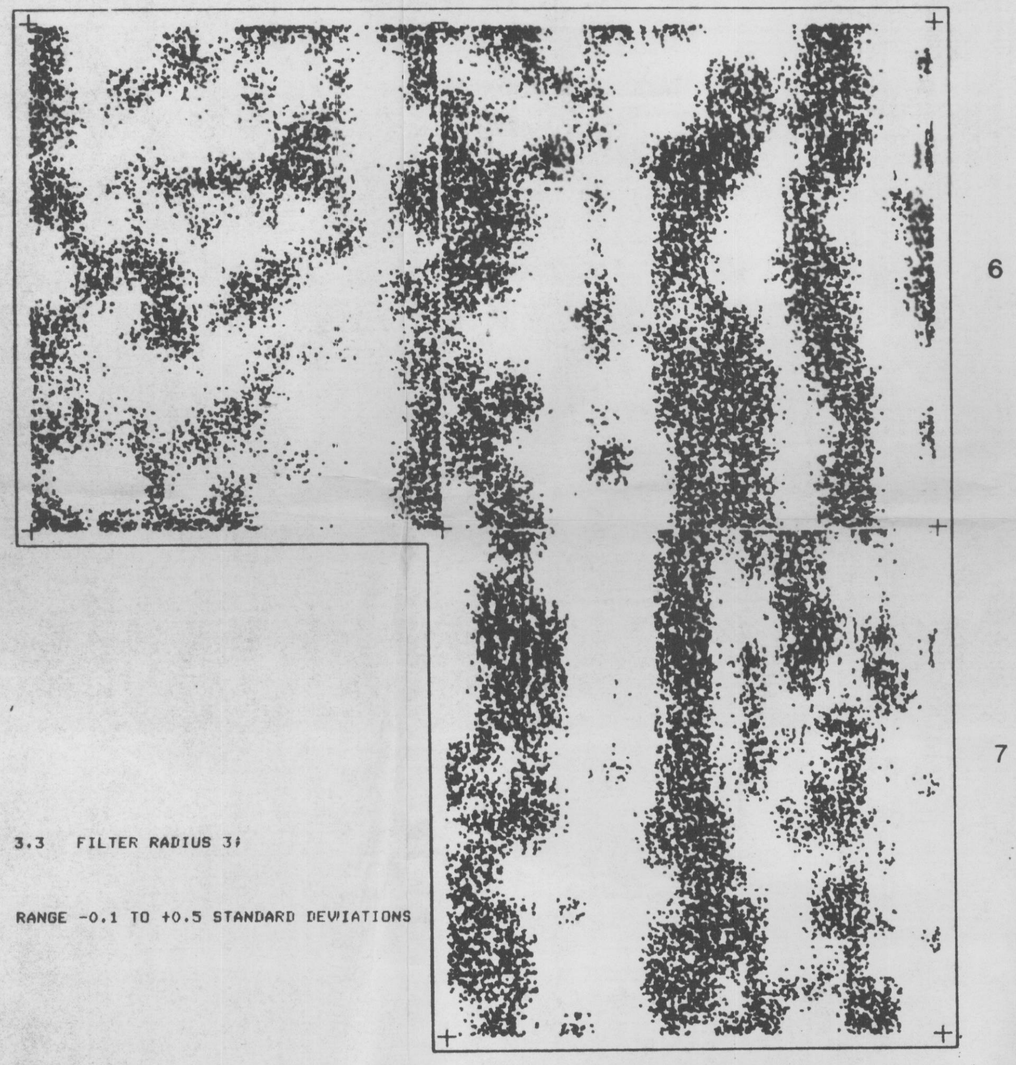
N



3.1 INITIAL DATA

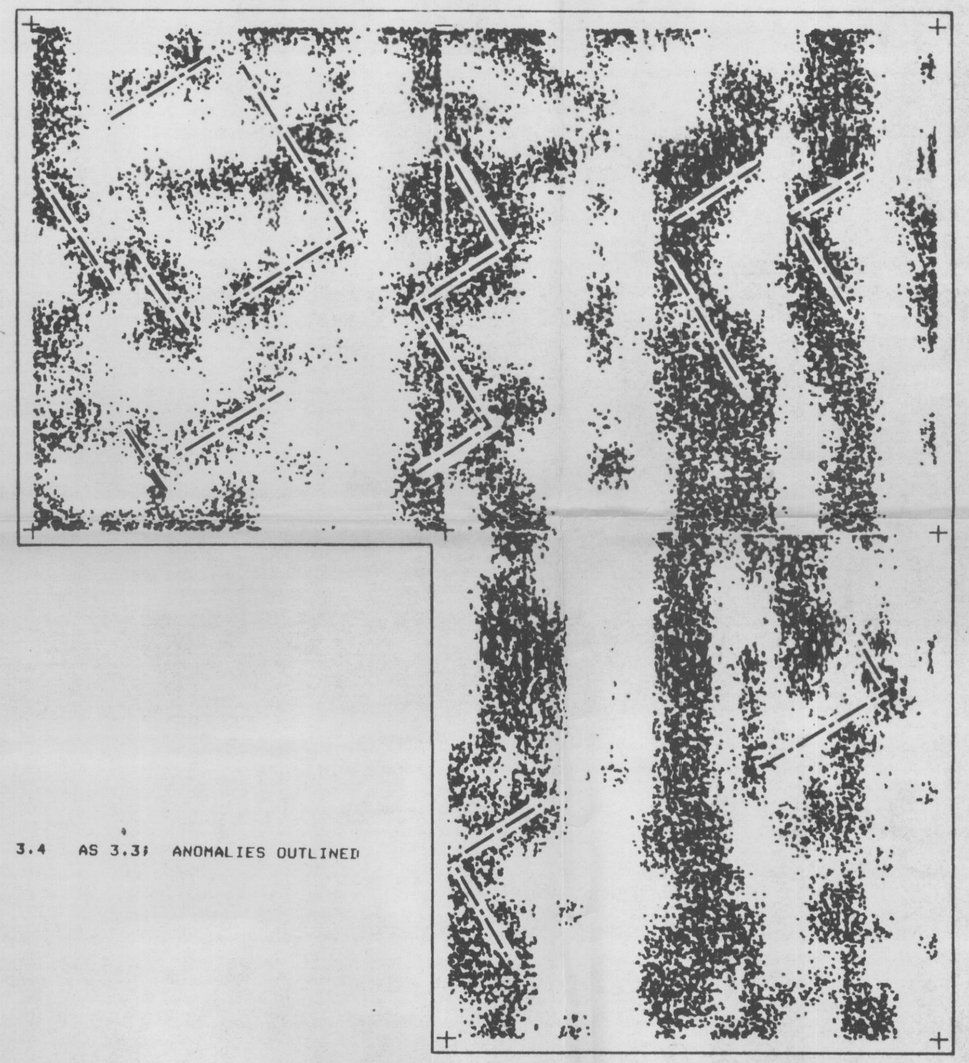


3.2 FILTER RADIUS 2



3.3 FILTER RADIUS 3½

RANGE -0.1 TO +0.5 STANDARD DEVIATIONS



3.4 AS 3.3½ ANOMALIES OUTLINED

CROMHALL Resistivity Survey

TWIN ELECTRODE CONFIGURATION½ 1 METRE PROBE SPACING

RESISTIVITY DATA SUPPLIED BY RMC AGGREGATE LAND SEARCH DEPARTMENT

AM Lab 1980

1:250